control operation of the laser resonator system **100** responsive to the information received from the sensor system **120**. In a particular embodiment, the controller **130** may change a focus associated with forward light (e.g., a focal characteristic of the forward beam), a focus associated with return light (e.g., a focal characteristic of the return beam), or both, in order to improve or to maintain operation of the laser resonator system **100**. To illustrate, the controller **130** may control a control device **134** (e.g., a control component) that is configured to change optical properties associated with the primary mirror **104**. For example, the primary mirror **104** may be a deformable mirror, and the control device **134** may be configured to adjust an amplitude associated with a shape of the primary mirror **104**. As another example, the control device **134** may be configured to change a pointing direction of the primary mirror **104**, to change a focal point of the primary mirror **104**, to move the primary mirror **104** (e.g., in a direction along the return optical path or the forward optical path), or a combination thereof. By changing the above-described optical properties of the primary mirror **104**, beams travelling along the return optical path or the forward optical path may be adjusted to change operation of the laser resonator system **100**.

[0030] In addition or in the alternative, the controller **130** may be coupled to a control device **132** that is coupled to the secondary mirror **102**. The control device **132** may be configured to change optical properties associated with the secondary mirror **102**. For example, the control device **132** may be configured to change a pointing direction of the secondary mirror **102**, to change a focal point of the secondary mirror **102**, to move the secondary mirror **102** (e.g., in a direction along the forward optical path or the return optical path), or a combination thereof. Similar control devices may be coupled to any one or more of the fold mirrors **108** or the active mirrors **106**. Thus, each of the reflective components (e.g., the mirrors **102**, **104**, **106**, and **108**) of the laser resonator system **100** may be adjustable by the controller **130** based on the energy ratio of the forward beam transmission and the return beam transmission in order to improve or maintain operation of the laser resonator system **100**.

[0031] In addition to adjusting the reflective components, or in the alternative, one or more of the pump light sources **110** may be controlled by the controller **130** responsive to the energy ratio. As explained above, the beams reflected within the laser resonator system **100** may reach high power levels. Thermal energy absorbed by the active mirrors **106** from the forward beam, the return beam, and the pump light may increase the temperature of the active mirrors **106**. The increase in temperature may cause changes in optical properties of the active mirrors **106**. For example, expansion due to heating may change the shape of one or more of the active mirrors **106**. By adjusting the pump light output from the pump light sources **110**, the change in temperature may be reduced or compensated for. For example, by reducing output power provided by the pump light sources **110**, the temperature change may be reduced and the optical properties (e.g., the shape) of the active mirrors **106** may be maintained such that the efficiency of the laser resonator system **100** is not reduced and the components are not damaged by overheating.

[0032] Additionally or alternatively, the controller **130** may be configured to shut down (e.g., turn off) the laser resonator system **100** to prevent damage. For example, the controller **130** may be configured to compare a measured energy ratio determined based on the output of the sensor system **120** to a particular expected energy ratio to identify a deviation between the measured energy ratio and the expected energy ratio. If the deviation exceeds a threshold value (e.g., an energy ratio safety margin), the controller **130** may shut down the laser resonator system **100** to prevent damage to one or more components. If the deviation does not exceed the threshold value, operation of the laser resonator system **100** may continue. Alternatively, rather than shutting down the laser resonator system **100** if the deviation exceeds the threshold value, the controller **130** may be configured to adjust optical properties of one or more components of the laser resonator system **100** (e.g., the mirrors **102**, **104**, **106**, and **108** and the pump light sources **110**, as described above) to reduce the deviation and thereby increase the efficiency of the laser resonator system **100**. In another particular embodiment, the sensor system **120** may implement a first threshold and a second threshold. When a deviation (between the measured energy ratio and the expected energy ratio) exceeds the first threshold the controller **130** may adjust at least one operating parameter of the laser resonator system **100** and when the deviation exceeds the second threshold the controller **130** may shut down the laser resonator system **100**.

[0033] During operation, the controller **130** causes the pump light sources **110** to provide pump light to the active mirrors **106** to cause the laser resonator system **100** to generate the output beam **140**. The controller **130** may receive at least one control signal from the sensor system **120** based on beam transmissions at the particular fold mirror **108**. Based on the at least one output signal, the controller **130** controls one or more components (e.g., elements) of the laser resonator system **100** to increase efficiency of the laser resonator system or to reduce a possibility of damage to components of the laser resonator system **100**. For example, the controller adjusts optical properties of one or more of the mirrors **102**, **104**, **106**, and **108** based on the energy ratio received from, or generated based on, the at least one output signal.

[0034] By controlling the laser resonator system **100** (e.g., via the controller **130**), based on the energy of the forward beam transmission, the energy of the return beam transmission, or the energy ratio (e.g., the ratio of the energy of the forward beam transmission and the energy of the return beam transmission), operation (e.g., the efficiency) of the laser resonator system **100** may be maintained or improved. Additionally, controlling the laser resonator system **100** based on the energy ratio may decrease the risk of damage to components of the laser resonator system **100**, such as overheating of the active mirrors **106** or the fold mirrors **108**.

[0035] Referring to FIG. **2**, a second embodiment of the laser resonator system **100** is illustrated and generally designated **200**. In the laser resonator system **200**, a gain (G) of each of the gain mediums of the active mirrors **106** may be set to a substantially similar value. In the laser resonator system **200**, the sensor system **120** is located behind a second fold mirror of the fold mirrors **108**. For example, in FIG. **2**, where the laser resonator system **200** includes N active mirrors **106**, gains G_**1**, G_**2**, and G_N of the active mirrors **106** may be substantially similar. The illustration of FIG. **2** is not limiting. In other embodiments, when the gain